7. On the Trachea of *Tantalus loculator* and of *Vanellus cayennensis*. By A. H. Garrod, M.A., F.R.S.

[Received May 21, 1878.]

In his 'Beiträge zur Naturgeschichte von Brasilien,' Maximilian, Prince of Wied[1], describes briefly and figures the lower end of the trachea of *Tantalus loculator*. A male specimen of the species having recently died in the Society's Gardens, I take the opportunity of more minutely pointing out its peculiarities and of comparing it with *T. ibis*, the windpipe of which, with its elaborate convolutions, I have had the opportunity of bringing before the notice of the Society upon a previous occasion[2].

In *Tantalus loculator* the trachea is not elongated as it is in *T. ibis*; nevertheless it is peculiarly modified, and differs in detail from that of any bird with which I am acquainted, although its plan of construction is perfectly Ciconiine.

The seventy-eight lowermost rings of the trachea are those which are modified, the rings above them being quite typical, of average depth, notched in front as well as behind, and overlapped to produce the well-known zigzag markings on the surface.

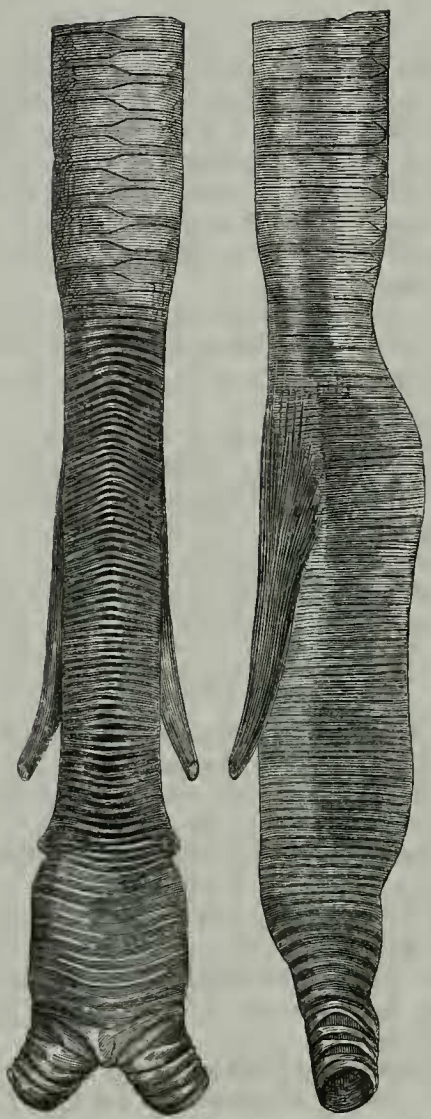
With the exception of the last one, all the modified rings are much reduced in depth; and of them the sixty-one upper rings are compressed from side to side and bent sharply in front, whilst the lower seventeen are somewhat flattened from before backwards and sharply bent laterally, the general effect of which is to produce a lateral flattening and an anterior carination of the whole tube opposite the fifty-one rings, as well as an antero-posterior flattening with a lateral carination in the part below. The change from the superior unmodified tube to the laterally compressed portion is somewhat abrupt, as is that between the two differently modified parts. In figure 1 *a* (p. 626) the front view of the lower end of the trachea is represented, figure *b* giving a side view of the same.

The powerful sterno-tracheal muscles leave the wind-pipe opposite the middle of the laterally flattened portion of the tube; and a few muscular fibres from their anterior margin are continued downwards for a short distance, but not nearly to the last ring, they being lost upon the sides of the trachea.

The arrangement above described is only an exaggeration of what is found in *Ciconia alba*, in which species the lowermost nine-and-twenty tracheal rings are extremely shallow and slender, the fifteen above the bifurcation of the bronchi being antero-posteriorly flattened, the fourteen above them being in no wise peculiar except for their slenderness. In *C. alba* there is, however, a small prolongation upwards of the lateral portions of the three lowermost tracheal rings, which forms a consolidated triangular process on each side, overlapping the next few rings, and looking extremely like rudiments of the

[1] Band iv. p. 687, tab. 1. figs 7 and 8.
[2] P. Z. S. 1875, p. 298.

Fig. 1.



a *b*

Lower end of the trachea of *Tantalus loculator* ♂.
a. View from the front; *b*. View from the right side.

similarly situated *processus vocales* of the passerine tracheophone syrinx, which resemblance is increased by the thinness of the neighbouring rings and their being flattened from before backwards.

In *Tantalus loculator* there is no trace of these triangular processes. Its last tracheal ring, or three-way piece, is not enlarged, as it is in so many birds; and the rings of the bronchi for some considerable distance are complete as in the Ciconiidæ generally, which is so very seldom found to be the case in the Class. In this last feature the Storks agree with the Cathartidæ, and the general arrangement of the bifurcation of the Stork's windpipe would require but little change to pass into a Cathartine type.

The uppermost bronchial rings are thinner on the outer side of each bronchus than they are internally, which consequently leaves greater gaps between them along the outer margin of the tubes. Ring four on one side and ring three on the other are partly reduplicated, the extra processes ending freely in the bronchial membrane.

From this description it is evident that these two *Tantali* differ greatly in the arrangement of their windpipes, whilst a recent comparison of specimens makes it evident to me that what I thought on seeing *T. loculator* might have been an error in my account of *T. ibis*, namely the *posterior* carination of the windpipe, is correct, in which, as well as in the relative lengths of trachea, the two species differ so much.

In other anatomical characters *Tantalus loculator* agrees with *T. ibis*, and is perfectly ciconiiform. In both the great pectoralis muscle is formed of two layers, as in the Steganopodes, Procellariidæ, and Cathartidæ only. The ambiens muscle is slender; the femorocaudal is minute, without any accessorius; and the semitendinosus, as well as its accessorius, are not large. There is no great gluteus muscle, nor any muscular slip from the biceps of the wing running to the patagium.

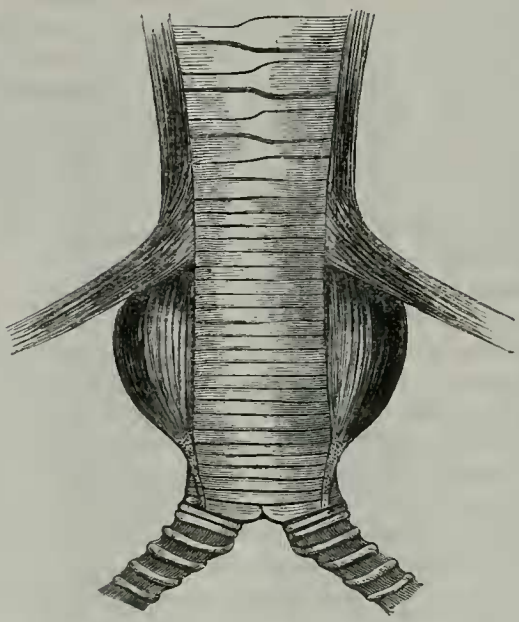
The small intestine measures six and a half feet, the cæca half an inch, and the large intestine nearly three inches. The stomach is capacious, with but a small muscular development. The tongue is an inch long and arrow-head shaped. The sub-equilobed liver has a gall-bladder.

In *Vanellus cayennensis* there is an exaggerated development of the intrinsic muscles of the trachea a short way above its bifurcation in both sexes that is quite worthy of special note, because the amount of muscular fibre there present is proportionately as much as in any bird with which I am acquainted.

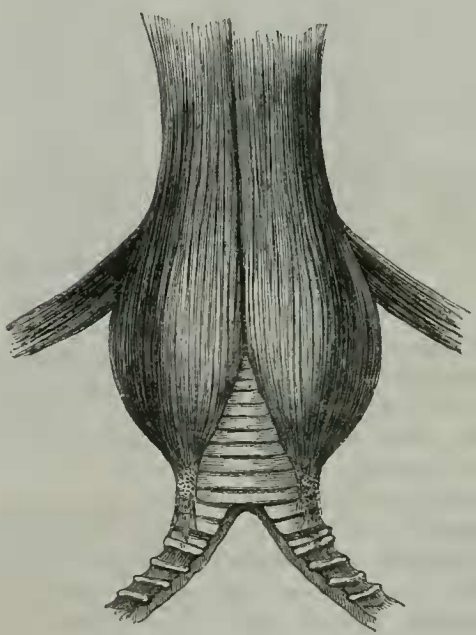
There is nothing peculiar about the windpipe itself or the bronchi, which are represented in the accompanying figure (p. 628). The uppermost two bronchial semirings are not like those which succeed them, but are like halves of tracheal rings. The third and fourth semirings are closely united, whilst those which follow are not modified in any way.

The sterno-tracheal muscles are powerful, and besides springing directly from the side walls of the windpipe opposite the spot where

Fig. 2.



a.



b.

Windpipe of *Vanella cayennensis*.
a. Anterior aspect; *b*. Posterior aspect.

they run off, their upper fibres are continuous up the trachea itself in front of and in contact with the intrinsic muscles. These latter, one on each side as usual, meet in the posterior middle line of the trachea, but are not unusually near in front; they are of considerable size throughout. Near their lower ends they increase immensely in bulk to form, combined posteriorly, a large subglobose mass which is situated opposite the twenty-four lowermost rings of the trachea, which are considerably shallower than those above them and consequently occupy a much less space than if they were of the same depth, as is the case in *Tantalus loculator*. There is a consolidation of the last few rings in adult birds, with which the first two bronchial semirings fuse to form a compound three-way piece, and it is to the lower elements of this that the powerful lateral muscles are attached (as well as to the third and fourth bronchial semirings slightly) by a broad fibro-tendinous continuation of their muscular substance, which fixes itself on each side along nearly the whole length of the semirings, especially the second, of which the extremities are alone free.

So far as I can find out by watching the living birds, there is nothing peculiar in their note to lead one to surmise so large a muscular supply for their lower larynx. They make a powerful screech, with no modulation in it; and it can hardly be possible that the extra muscular development has not some other function to perform. What that may be it is not easy to surmise.

8. On the Anatomy of the Maleo (*Megacephalon maleo*).

By A. H. Garrod, M.A., F.R.S.

[Received May 21, 1878.]

Besides being a Megapode, *Megacephalon maleo* is interesting as a peculiar form; I therefore take the opportunity of bringing before the Society the results of my dissection of three specimens of this bird which have died in the Gardens.

Pterylosis.—In the distribution of its feather-tracts the Maleo is somewhat different from the typical Gallinæ. Nitzsch briefly records what he found in a bad specimen of *Megapodius rubripes*, mentioning that the tracts were not different from those in allied birds, and that the oil-gland was tufted. This is all we know of the pterylosis of the group.

In *Megacephalon maleo* the anterior surface of the neck is covered, not thickly, with feathers, which only tend to divide opposite the furcula into the two pectoral tracts, each of which descends, strong and uniform in breadth, to opposite the middle of the carina sterni, where it ceases obtusely. The ventral tract does not exist over the anterior or upper part of the pectoral region, but commences narrow close to and opposite the middle of the carina sterni, dilating opposite the abdomen, near the middle line of which it descends parallel to its fellow, to just above the anus, where the two meet. The skin over the carina and in the middle line of the abdomen is hard and